CLAIMS

1. A method of removing contaminants from a stream of carbon dioxide (CO_2), comprising:

contacting a stream of CO_2 with a quantity of at least one mixed metal oxide for a period of time to reduce the contaminant content of the stream.

2. The method as in claim 1, wherein the contaminant content is reduced to not more than 100 parts per billion (ppb).

3. The method as in claim 1, wherein the contaminant content is reduced to not more than 10 ppb.

4. The method as in claim 1, wherein the contaminant content is reduced to not more than 1 ppb.

5. The method as in claim 1, wherein the mixed metal oxide comprises metals having different oxidation states.

6. The method as in claim 1, wherein the mixed metal oxide comprises metals having different electronegativities.

7. The method as in claim 1, wherein the mixed metal oxide comprises metals having different coordination environments.

8. The method of claim 1, wherein the mixed metal oxide is selected from a group comprising: copper (Cu) and zinc oxide (ZnO); iron (Fe) and manganese oxide (MnO_x); nickel oxide (NiO) and titanium oxide (TiO_x); palladium oxide (PdO_x) and cerium oxide (CeOx); and vandium oxide (VO_x).

9. A method for activation and regeneration of mixed metal oxide adsorbents for the purification of carbon dioxide (CO_2) comprising:

heating the adsorbent to a first temperature to release contaminants adsorbed thereto;

exposing the heated adsorbent to an oxidizing agent to oxidize the adsorbent;

cooling the adsorbent to a second temperature; and

exposing the cooled adsorbent to a reducing agent to produce a mixed metal oxide.

10. The method of claim 9, wherein the first temperature is between about 300°C to about 550°C.

11. The method of claim 10, wherein the first temperature is about 400°C.

12. The method as in claim 9, wherein the oxidizing agent comprises oxygen (O_2).

13. The method as in claim 9, wherein the second temperature is between about 100°C to about 250°C.

14. The method as in claim 9, wherein the reducing agent comprises a mixture of hydrogen (H_2) and an inert gas.

15. The method as in claim 14, wherein the hydrogen gas comprises between about 1% to about 5% of the mixture by volume.

16. The method in claim 14, wherein the inert gas is selected from the group consisting of nitrogen (N_2) and argon and combinations thereof.

17. A method for continuous purification of carbon dioxide (CO_2), comprising:

purification of CO_2 by the method of claim 1 in a first bed of a dual bed

purifier apparatus;

regeneration of an adsorbent in a second bed of the dual bed purifier apparatus by the method of claim 9, during the coincident purification of the CO_2 in the previous step; followed by

purification of CO_2 by the method of claim 1 in the second bed after completion of regeneration of the adsorbent by the method of claim 9, coincident with the regeneration of the adsorbent of the first bed by the method of claim 9; and

repeating the steps for continuous purification.